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Project Number 5563

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Reference            Clean Contract No. N62472-90-D-1298,  
Contract Task Order No. 0223

Subject             Phase 2 Pilot Study - Interim Results and Recommendations  
Fire Training Area, Vapor Extraction/Air Sparging Pilot System  
NWIRP Calverton, New York

Dear Mr. Lehman,

Please find enclosed four copies of the subject update for your use

If have any questions or require additional information please call me at (412) 921-8375

Sincerely,

  
David D. Brayack, P.E.  
Project Manager

/DDB

cc:    Mr. R. Boucher (Navy) w/o attachment  
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## 1.0 INTRODUCTION

This report has been prepared to summarize the Phase 2 Air Sparging/Soil Vapor Extraction Study interim results for Site 2 - Fire Training Area at the NWIRP Calverton, New York. The pilot study was restarted on May 2, 1996 and except for three days, has operated continuously through June 1996. The three-day down time is believed to have resulted from an electrical storm moving through the area resulting in the blowers being tripped off.

The preliminary findings, activities being conducted, and recommendations are provided below. The data is being presented in expanded tables from the (Phase 1) Pilot Study Report to show both the past and current data. In addition, blank spaces are provided in the report for future data. Note that Table 3-2 (Soil Data) will not be presented in this update since soil samples will not be collected until the end of July 1996.

## 2.0 FLOW RATES

For most of the wells, the air injection and extraction rates are similar to the rates from the fall of 1995 (Phase 1 Pilot Study). However the target air injection rate of 5 to 9 CFM could not be achieved in 5 of the 16 well injection wells, (See Table 3-1), with actual air injection rates in these 5 wells of only 0.7 to 3 CFM being achieved. A high water table elevation (increasing the pressure needed to displace the water) or plugging of the aquifer/well screens is the believed cause of this problem. Note that this condition occurred during the Phase 1 pilot study and corrected itself during the test.

The current plan for these wells is to continue to allow the system to run to determine if the wells will improve on their own. In addition, on July 11, 1996 Injection Well I13 will be checked to determine if plugging of the well screen has occurred. This well will be surged with water and air, and samples of the water in the well will be checked for iron, clay, formation material, and biological solids.

In the event that the flow rate in these wells do not increase to the target rates by the end of July, CF Braun recommends that a new sheave (pulley) be purchased and installed on the blower to allow for a higher discharge pressure. The sheave is a low cost item, which would not result in a cost impact to the project. However, the use of the new sheave would decrease the total air injection rate by 10 to 20%.

In addition, in early June, CF Braun measured carbon dioxide (CO<sub>2</sub>) using Draeger Tubes and total Volatile Organic Compounds using a Flame Ionization Detector (FID) in each extraction well header. For the extraction headers which were measured to have a CO<sub>2</sub> and FID reading greater than the system average, the flow from that header was increased by 50%. To maintain a constant system flowrate, the flows from the other extraction headers were either maintained at the same rates, or decreased.

### 3.0 GROUNDWATER DATA

Data from the groundwater samples collected at the start of the trial (05/01/96) are presented in Tables 3-3 and 3-4. In general, these results are similar to those obtained at the end of the Phase 1 Pilot Study, although some differences were noted and are discussed below.

For the permanent monitoring well (GW02), the xylene concentration decreased to below 100 ug/l for the first time (to 32 ug/l). Xylene is the one VOC that did not decrease significantly in concentration in this well during the Phase 1 Pilot Study.

For air injection well IW06, chlorinated VOCs were observed for the first time in this well. These chemicals were known to be present in the area of this well but were found only in the more shallow groundwater (0 to 4 feet below the water table) as opposed to the depth of the injection well screen interval (7 to 8 feet below the water table). The presence of these chemicals at the injection well depth is an indication that vertical mixing of aquifer is occurring.

### 4.0 AIR DATA

Data from air samples collected at the re-start of the trial (05/02/96) and one month into the trial (06/07/96) are presented in Table 3-5. At the re-start of the trial, the VOC concentrations in the combined extraction system are approximately 40% of those observed in November 1995. Based on the results of air samples collected after carbon treatment, the majority of chemicals are being absorbed onto vapor phase carbon units.

Air samples from the North Field (Extraction Well E1 to E6) continue to show very-low levels of VOCs. Based on this data, CF Braun recommends that air extraction in this area be discontinued on July 11, 1996.

## **5.0 DRAEGER TUBE TESTING (CO2)**

Draeger tube testing for CO<sub>2</sub>, toluene, and TPH as well as FID readings from select air extraction wells and the total extraction system are presented in Table 3-6. This data indicates that CO<sub>2</sub>, which is a natural break down product of organics continues to be removed at relatively high concentrations. Estimated organic removal rates (based on CO<sub>2</sub>) for May and June are 4,000 and 2,000 pounds of carbon, respectively. Based on background readings, between 7% and 40% of the CO<sub>2</sub> may result from degradation of natural organics (e.g. leaves).

One trend that was observed with the CO<sub>2</sub> data is that a significant decrease in the CO<sub>2</sub> concentration from the extraction system occurred in early June, with the average dropping from 1.0/1.5% in May to 0.5% in June. The reason for this drop in CO<sub>2</sub> concentration is uncertain. The decrease could have resulted from a natural flushing of CO<sub>2</sub> buildup in the soil gas. However, this drop also coincides with the pilot system being down for approximately 3 days prior to June 6, 1996. This outage and associated drop in oxygen may have shocked biological components of the system. CF Braun plans to continue operating the system to track the CO<sub>2</sub> results.

Also, one test area was established during the Phase 1 trial to determine if the addition of nitrogen (Urea) affected the CO<sub>2</sub> generation rates (and therefore biodegradation rates). Based on the nitrogen addition evaluation, the conclusion from the Phase 1 Pilot Study was that the Urea had a minimal impact on the CO<sub>2</sub> generation rates. However, based on the Phase 2 CO<sub>2</sub> data, there may now be a significant difference in test and control areas, with much higher CO<sub>2</sub>s (by a factor of 3 to 4) being observed in the area where the Urea was added. CF Braun plans to continue evaluating this test.

## **6.0 FREE PRODUCT MEASUREMENT**

Free product thickness measurements were conducted in May and June 1996. The free product thickness measurements are presented in Table 3-8. This data is still not conclusive. CF Braun is planning to continue collecting free product thickness measurements.

## **7.0 RADIAL EXTENT OF INFLUENCE TESTS FOR EXTRACTIONS WELLS**

CF Braun conducted tests to determine the extent of influence that an air extraction well would have on the unsaturated soils. This testing was originally planned to be conducted in

December 1995, however, cold weather forced the AS/SVE system to be shut down prior to testing.

Field testing was performed on May 2, 1996 using the portion of the pilot-scale system located directly east of the Fire Training Ring. A plan view of the test area is illustrated on Figure 1-1. The location of the test area relative to the entire pilot-scale piping network can be seen by comparing Figure 1-1 to the full system plan view illustrated on Drawing 1 of the Summary Results Report (CF Braun, 1996).

As illustrated on Figure 1-1, temporary well points (WP1 - WP4) were installed at predetermined locations surrounding air extraction well E17 so that induced pressure changes within the FTA overburden caused by air flow through E17 could be measured at several intermediate locations between E17 and air injection well I9. The well construction cross-sections illustrating the relative depths of the screened sections of the air injection, air extraction and air monitoring wells are also included on Figure 1-1.

The test results are summarized in Table A. Based on the Table A data, the following conclusions can be made regarding the extent of influence of an air extraction well of the pilot-scale AS/SVE system at the FTA Site:

- Test results indicate that at an air extraction rate of 5 cfm, with no air injection, a vacuum can be measured at a distance of 30 feet from the extraction well, but not at a distance of 40 feet. At air extraction rates of 8 cfm to 12 cfm, a detectable (but not measurable) vacuum was induced at a distance of 40 feet.
- The results of test number 2 indicate that when air is being extracted from well E17 at 5 cfm and air is being injected into well I9 at a rate of 9 cfm, a positive pressure was detected in the 3 monitoring points located 11 feet, 21 feet and 30 feet away from well E17. CF Braun is planning to conduct similar tests, but at a lower air injection to air extraction ratio.

## **8.0 PRELIMINARY DISSOLVED OXYGEN MEASUREMENTS IN MONITORING WELLS**

CF Braun measured dissolved oxygen concentrations in the shallow aquifer at five monitoring wells. The purpose of this testing was to determine whether the dissolved oxygen concentrations could be used as an indicator of the horizontal extent of influence of the air injection wells.

Groundwater was sampled in the permanent groundwater monitoring well GW02-S and Grumman monitoring wells DH, DG, DS and DR. The wells to be sampled were selected based on the relative distances to air injection wells, where air was delivered into the shallow aquifer. The groundwater sampling wells and the relative locations of these wells to particular air injection wells is illustrated on Diagram 1 of the final (Phase 1) Result Report.

Shallow aquifer samples were collected from each of the monitoring wells on June 6, 1996, beginning approximately 60 minutes after the pilot-scale AS/SVE system was temporarily turned off for routine servicing. Groundwater samples were also collected with the AS/SVE system operating later that day and on June 7. The representative groundwater samples were collected using a low flow, peristaltic pump, after 3 well volumes of groundwater had been purged from each of the monitoring wells. Groundwater temperature and pH were also measured at the same time for each sample. Measurements were made using a Hureba field monitoring device.

The monitoring results indicated that there was no dissolved oxygen in the groundwater collected from the sampled wells. C.F. Braun is planning to conduct similar tests during the end of July 1996 to determine if DO levels rise in the monitoring wells.

## **9.0 RECOMMENDATIONS FOR FUTURE ACTIVITIES**

- 1.0 Except as noted below, CF Braun intends to continue operating the system and collecting samples as planned.
- 2.0 Because of the low VOC extraction rates, discontinue air extraction from Wells E1 to E6 on July 11, 1996. This will allow air extraction rates to be increased at other well clusters.
- 3.0 Investigate potential causes of insufficient air injection in several air injection wells. If the rates in these wells do not improve by the end of July, then change out the blower sheave to allow the system air pressure to be increased.
- 4.0 Conduct additional radial extent of testing for Extraction Well E 17, but at lower air injection to extraction ratios.

- 5.0 Conduct a 2-week trial in which air is not injected into the aquifer. CO<sub>2</sub> measurements will be performed as a primary basis for this evaluation. This test will be started in the beginning of August.

TABLE 3-1

**AIR EXTRACTION AND INJECTION FLOW RATES (ACFM)  
AS/SVE - NWIRP CALVERTON**

Sample Date	8/31/95	09/07/95	10/04/95	10/12/95	10/25/95	11/20/95	05/02/96	06/07/96				
Measured Extraction Blower Header	262	262			87*							
<b>Extraction Well Bank Measurements (calculated average per well)</b>												
E1 - E6	7	7	5	5	3	3	5	3				
E7 - E9	7	9	6	6	9	11	7	6				
E10 - E12	7	7	9	9	5	7	7	3				
E13 - E16	7	7	6	7	8	9	8	7				
E17	7	7	8	11	13	13	6	20				
E19 - E23	8	6	9	12	11	11	7	11				
E18 and E 24 - E29	6	6	8	6	3	3	4	4				
E30 - E32	7	8	0	4	3	4	5	5				
Calculated Extraction Air Flow	217	218	199	229	196	209	188	185				
E1		2		7	7							
E2		7										
E4		8		10	10							
E7												
E10	5	4		8	8							
E12	8	4										
E13				9	9							
E15	5	5										
E18	4	4		4	4							
E19	9	7		13	13							
E20				8	8							
E22				13	13							
E23		9		14	14							
E24	4	5		4	4							
E25		7										
E26												
E28				7	7							
E29		9		10	10							
E30		9		12	12							
E31		7		5	5							
E32				4	4							



**TABLE 3-1 (Continued)**  
**AIR EXTRACTION AND INJECTION FLOW RATES (ACFM)**  
**AS/SVE - NWIRP CALVERTON**

Monitoring Date	08/31/95	09/07/95	10/04/95	10/12/95	10/25/95	11/22/95	05/02/96	05/09/96	05/16/96	05/26/96	05/30/96	06/06/96
Injection Header		157	153	131	140	140		140				
<b>Individual Injection Well Measurements</b>												
I1	4	2	4	4	4	5	11	6	6	7	5	6
I2	4	4	3	4	2	8	13	7	7	9	8	8
I3	9	6	9	10	10	10	35	16	16	19	16	14
I4	11	9	12	8	9	10	13	26	26	13	14	12
I5	7	5	9	11	12	4	13	14	14	14	9	13
I6	2	34	33	13	11	11	3	11	11	12	9	11
I7	7	5	13	9	10	7	1	5	5	7	5	5
I8	8	6	11	9	13	9	6	13	13	11	13	13
I9	13	16	4	7	8	2	7	13	13	12	12	12
I10	2	1	13	4	9	7	1	1	1	9	9	7
I11	0	1	8	11	11	13	1	0.5	0.5	0.5	2	0.5
I12	0	1	2	11	10	13	0.5	0.5	0.5	1	3	0.5
I13	2	2	5	4	5	11	2	2	2	1	2	1
I14	4	7	11	11	13	11	13	10	11	11	11	9
I15	0	1	1	4	2	11	1	1	1	1	1	0.5
I16	13	27	9	19	13		4	7	9	10	10	10
Calculated Injection Air Flow	86	127	148	137	142	132	125	146	136	138	129	122

**TABLE 3-1 (Continued)**  
**AIR EXTRACTION AND INJECTION FLOW RATES (ACFM)**  
**AS/SVE - NWIRP CALVERTON**

Monitoring Date	06/13/96	06/20/96	06/27/96	07/02/96								
Injection Header												
<b>Individual Injection Well Measurements</b>												
I1	5	6	6	5								
I2	8	6	8	8								
I3	15	17	15	15								
I4	9	12	13	13								
I5	14	15	17	17								
I6	13	12	13	13								
I7	5	5	5	5								
I8	14	14	14	15								
I9	12	10	11	11								
I10	4	3	3	3								
I11	0.5	0.5	0.7	0.7								
I12	0.5	0.5	0.7	0.7								
I13	1	1	1	1								
I14	9	10	10	10								
I15	0.7	0.8	1	0.7								
I16	14	14	13	13								
Calculated Injection Air Flow	135	137	132	131								

TABLE 3-3

GROUNDWATER RESULTS (ug/L)  
PERMANENT MONITORING WELL GW02  
AS/SVE - NWIRP CALVERTON

Sample Date	MDLs	08/16/95	09/28/95	10/26/95	11/21/95	12/19/95	01/23/96	05/01/96		
<b>TCL Volatiles</b>										
Acetone	6	52		16 J	17 J	--	280			
2-Butanone	3	140	40		3 J	--	100	34		
Benzene	1	8		1 J		--		2 J		
Ethylbenzene	2	13	13	12	10	--		4 J		
Vinyl Chloride	2	25				--		9 J		
Methylene Chloride	2					--				
4-Methyl - 2-Pentanone	5	15	19	8 J		--		11		
Carbon Disulfide	3			48		--				
Chloroethane	3	420 D	21	20	17	--	40 J	36		
1,1-Dichloroethane	2	200	39	36	24	--	69	51		
1,1-Dichloroethene	1	8		6	1 J	--				
cis 1,2-Dichloroethene	2	220	18	21	14	--	53	39		
1,2-Dichloroethane	2	2 J				--				
Tetrachloroethene	1	12	5	12	12	--	37 J	8 J		
Trichloroethene	1	2 J		1 J	1 J	--		2 J		
1,1,1-Trichloroethane	1	59	20	41	26	--	29 J	6 J		
Toluene	2	250	78	75	62	--	94	49		
2 Hexanone	7	15	21			--				
Total Xylenes	1	110	120	120	100	--	140	32		
<b>Total Chlorinated VOCs</b>		<b>948</b>	<b>103</b>	<b>137</b>	<b>95</b>	<b>--</b>	<b>228</b>	<b>151</b>		
<b>Total Non Chlorinated VOCs*</b>		<b>411</b>	<b>254</b>	<b>264</b>	<b>172</b>	<b>--</b>	<b>234</b>	<b>98</b>		

TABLE 3-3 (Continued)  
GROUNDWATER RESULTS  
PERMANENT MONITORING WELL - GW02  
AS/SVE NWIRP CALVERTON, NEW YORK

Sample Date	MDLs	8/16/95	9/28/95	10/26/95	11/21/95	12/19/95	1/23/96	05/01/95		
TCL Semivolatiles										
Phenol	1	35	22	8 J				-		
2-Methylphenol	2	23	13	7 J				-		
2,4-Dimethylphenol	1	38	17		23		36 J	-		
1,4-Dichlorobenzene	1	2 J						-		
1,2-Dichlorobenzene	1	5 J	3 J	3 J		4 J		-		
1,2,4 Trichlorobenzene	1		2 J	3 J	4 J	1 J		-		
Acenaphthene	1						26 J	-		
Dibenzofuran	1							-		
Fluorene	1	5		1 J	2 J	3 J	39 J	-		
Phenanthrene	1	4 J			2 J	1 J		-		
Anthracene	1							-		
Carbazole	1				8 J			-		
Fluoranthene	1	5 J			1 J			-		
Pyrene	1	4 J	2 J	2 J	2 J	1 J		-		
Butylbenzylphthalate	2							-		
Di-n-butylphthalate	1			1 J	1 J	2 J		-		
Benzo(a)anthracene	1							-		
bis(2-Ethylhexyl)phthalate	2	5 J	5	4 J	160	36	43 J	-		
Chrysene	1							-		
Benzo(b)fluoranthene	2							-		
Benzo(k)fluoranthene	2							-		
Benzo(a)pyrene	2							-		
Indeno(1,2,3-cd)pyrene	2							-		

TABLE 3-3 (Continued)  
GROUNDWATER RESULTS  
PERMANENT MONITORING WELL - GW02  
AS/SVE NWIRP CALVERTON, NEW YORK

Sample Date	MDLs	8/16/95	9/28/95	10/26/95	11/21/95	12/19/95	1/23/96	05/01/96		
Benzo(g,h,i)perylene	2							-		
2-Methylnaphthalene	1	19	36	58	87	55	20 J	-		
4-Methylphenol	2	250 D	91	17		7 J	72 J	-		
Naphthalene	1	45	51	63	67	35	16 J	-		
Isophorone	1					8 J		-		
<b>Total Semivolatile VOCs</b>		<b>440</b>	<b>242</b>	<b>167</b>	<b>357</b>	<b>153</b>	<b>252</b>	-		
PCB-1260	1	26	10	9	8	2.6 J	20	-		
Endosulfan I	0.01	0.04 J		0.009 J				-		
Endosulfan II	0.3			0.34			0.46	-		
Alpha BHC	0.01			0.007 J		0.03 J		-		
Gamma BHC-Lindane	0.02					0.05 J	0.05	-		
Dieldrin	0.01			0.08			0.08	-		
Heptachlor							0.04	-		
Aldrin							0.02	-		
<b>Nitrate Nitrogen</b>		--								
<b>Nitrite Nitrogen</b>		--						0.07		

-- Sample not collected  
Blank Chemical not detected above Method Detection Limit(MDL)  
J Estimated value  
D Analysis of a diluted sample  
\* Totals do not include acetone and 2-butanone, which are likely to be laboratory contaminants.

TABLE 3-4

GROUNDWATER RESULTS (ug/L)  
AIR INJECTION WELLS IW06, IW13 and IW16  
AS/SVE - NWIRP CALVERTON

## Air Injection Well IW06

Sample Date	MDLs	8/16/95	9/28/95	10/26/95	11/21/95	12/19/95	05/01/96		
<b>TCL Volatiles</b>									
Acetone	6	10 J							
Chloroethane	3						11		
1,1 Dichloroethane	2						82		
1,2 Dichloroethene	1						9 J		
1,1,1 Trichloroethane	1						18		
Trichloroethene	1						1 J		
Tetrachloroethene	1						5 J		
2-Butanone	3		27				23		
<b>Total Chlorinated VOCs</b>		0	0	0	0	0	126		
<b>Total Non-Chlorinated VOCs</b>		0	0	0	0	0	0		
Nitrate Nitrogen		--	20000	@	13200	--	1230		
Nitrite Nitrogen		--		@		--			

## Air Injection Well I13

Sample Date	MDLs	8/16/95	9/28/95	10/26/95	11/21/95	12/19/95	05/01/96		
<b>TCL Volatiles</b>									
Acetone	6	10 J							
2-Butanone	3		23				5 J		
1,1-Dichloroethane	2			7	13	12	14		
1,1-Dichloroethene	1			5	2 J				
Tetrachloroethene	1	4 J	2 J	4 J	2 J	2 J	3 J		
Trichloroethene	1	2 J	2 J	11	8	7	4 J		
1,1,1-Trichloroethane	1	5 J	5	38	34	22	31		
<b>Total Chlorinated VOCs</b>		11	9	65	59	43	57		
<b>Total Non Chlorinated VOCs</b>		0	0	0	0	0	0		
Nitrate Nitrogen		--	--	--	--	--	3710		
Nitrite Nitrogen		--	--	--	--	--	60		

TABLE 3-4 (Continued)  
GROUNDWATER RESULTS (ug/L)  
AIR INJECTION WELLS IW06, IW13 and IW16  
AS/SVE -NWIRP CALVERTON

Air Injection Well I16									
Sample Date	MDLs	8/16/95	9/28/95	10/26/95	11/21/95	12/19/95	05/01/96		
<b>TCL Volatiles</b>									
Acetone	6	28		16 J					
2-Butanone	3	7 J	35	13					
Ethylbenzene	2			3 J	10				
Methylene Chloride	2	4 J							
4-Methyl - 2-Pentanone	5				6 J				
Chloroethane	3	22		94	100	16			
1,1-Dichloroethane	2	85	57	170	300 D	210	34		
1,1-Dichloroethene	1	12		6	15	2 J			
cis 1,2-Dichloroethene	2			3 J	7	2 J			
Tetrachloroethene	1	4 J	2 J	1 J					
Trichloroethene	1	9	5 J	3 J	1 J	2 J			
1,1,1-Trichloroethane	1	120	33	37	170	85	8 J		
Toluene	2	11		8	5				
Total Xylenes	1	10		13	35	8	2 J		
<b>Total Chlorinated VOCs</b>		<b>256</b>	<b>97</b>	<b>314</b>	<b>593</b>	<b>317</b>	<b>42</b>		
<b>Total Non-Chlorinated VOCs</b>		<b>21</b>	<b>0</b>	<b>14</b>	<b>36</b>	<b>8</b>	<b>2</b>		
Nitrate Nitrogen		--	--	--	--	--			
Nitrite Nitrogen		--	--	--	--	--			

**TABLE 3-4 (Continued)**  
**GROUNDWATER RESULTS (ug/L)**  
**AIR INJECTION WELLS IW06, IW13 and IW16**  
**AS/SVE -NWIRP CALVERTON**

@	Sample broken in transit
--	Sample not collected
Blank	Chemical not detected above Method Detection Limit(MDL).
J	Estimated value
D	Analysis of a diluted sample



TABLE 3-5

AIR MONITORING RESULTS (ug/m<sup>3</sup>)  
VAPOR EXTRACTION AIR STREAM  
AS/SVE - NWIRP CALVERTON

## AIR SAMPLE FT-AS00-01

Monitoring Date	MDLs	9/1/95	9/7/95	9/29/95	10/25/95	11/20/95	05/02/96		
Vinyl Chloride	0.6	170	49	38					
Chloroethane	0.6	4,600	2,200 D	1,900	12 D	150	70		
Chloromethane			6	19					
Acetone	2.0	140	100	41	66 D	35			
2-Butanone	2.0	29							
Carbon Disulfide	2.0	6	30	19	14 D	24			
Methylene Chloride	1.9	11	30		30 D				
1,1-Dichloroethane	0.9	8,600	8,000 D	10,000	4,200 D	1,800	1,010		
1,2 Dichloroethane	0.9	5		11					
1,1-Dichloroethene	0.9	87	100	94	6 D	16			
trans-1,2-Dichloroethene	0.9	10	15	10					
cis 1,2-Dichloroethene	0.9	990	820 D	940	500 D	300			
1,1,1-Trichloroethane	1.0	9,700	11,000 D	15,000	12,000 D	7,000	2,600		
Benzene	0.7	67	68	70	34 D	35			
Trichloroethene	1.0	440	340	270	140 D	120			
Toluene	0.8	2,700	2,200 D	2,500	1,100 D	400	160		
1,1,2-Trichloroethane	1.0	45	53	56					
Tetrachloroethene	1.0	920	650	1,000	530 D	550	370		
Ethyl Benzene	1.0	310	230	220	290 D	180			
1,4-Dichlorobenzene	3.0			4 J					
m/p-Xylene	1.0	1,200	670	870	1,400 D	860	85		
o-Xylene	1.0	700	490	660	1,000 D	660	150		
<b>Total Chlorinated VOCs*</b>		<b>26,007</b>	<b>23,573</b>	<b>29,612</b>	<b>17,528</b>	<b>10,056</b>	<b>4,050</b>		
<b>Total Non-Chlorinated VOCs*</b>		<b>5,152</b>	<b>3,788</b>	<b>4,380</b>	<b>3,904</b>	<b>2,194</b>	<b>395</b>		

TABLE 3-5 (Continued)  
AIR MONITORING RESULTS (ug/m<sup>3</sup>)  
AS/SVE NWIRP CALVERTON

AIR SAMPLE FT-AS00-02									
Monitoring Date	MDLs	9/1/95	9/7/95	9/29/95	10/25/95	11/20/95	05/02/96	06/06/96	
Vinyl Chloride	0.6	5 D	37	17					
Chloroethane	0.6		270 D	1,300	62 D	190		17	
Chloromethane				1 J					
Acetone	2.0	120 D	120	60		38			
2-Butanone	2.0	91 D	7	15					
Carbon Disulfide	2.0		7			18			
Methylene Chloride	1.9	40 D	120	12				10	
Chloroform	1.0		9						
1,1-Dichloroethane	0.9		5	78	15,000 D				
1,2 Dichloroethane	0.9					4,000			
1,1-Dichloroethene	0.9		1 J		63 D	60			
trans-1,2-Dichloroethene	0.9					6			
cis 1,2-Dichloroethene	0.9		1 J		480 D	610			
1,1,1-Trichloroethane	1.0		13		21,000 D	13,000			
Benzene	0.7		1 J	1	5 D	19			
Trichloroethene	1.0		2 J	2	25 D	100			
Toluene	0.8	27 D	33	24	190 D	200	14	25	
Tetrachloroethene	1.0		7 J	23	41 D	110		25	*
Ethyl Benzene	1.0		7	1 J		8			
1,4-Dichlorobenzene	3.0		8						
m/p-Xylene	1.0	7 D	29	5		12		10	
o-Xylene	1.0		17	2 J		6			
Styrene	0.9		3 J						
<b>Total Chlorinated VOCs*</b>		<b>5</b>	<b>353</b>	<b>1,421</b>	<b>36,671</b>	<b>18,076</b>	<b>0</b>	<b>42</b>	
<b>Total Non-Chlorinated VOCs*</b>		<b>34</b>	<b>97</b>	<b>33</b>	<b>195</b>	<b>263</b>	<b>14</b>	<b>35</b>	

**TABLE 3-5 (Continued)**  
**AIR MONITORING RESULTS (ug/m<sup>3</sup>)**  
**AS/SVE NWIRP CALVERTON**

**AIR SAMPLE FT-AS00-16**

Monitoring Date	MDLs	10/25/95	11/20/95	05/02/96	06/06/96
Vinyl Chloride	0.6				
Chloroethane	0.6				
Chloromethane					
Acetone	2.0		36		
2-Butanone	2.0		56		
Carbon Disulfide	2.0		9		
Methylene Chloride	1.9		8		14
Chloroform	1.0				
1,1-Dichloroethane	0.9	160 D	2 J		
1,2 Dichloroethane	0.9				
1,1-Dichloroethene	0.9		1 J		
trans-1,2-Dichloroethene	0.9				
cis 1,2-Dichloroethene	0.9		2 J		
1,1,1-Trichloroethane	1.0	320 D	10	14	
Benzene	0.7		3 J		
Trichloroethene	1.0		2 J		
Toluene	0.8	290 D	36	10	85
1,1,2-Trichloroethane	1.0				
Tetrachloroethene	1.0		15	15	31
Ethyl Benzene	1.0		2 J		
1,4-Dichlorobenzene	3.0				
m/p-Xylene	1.0		6		
o-Xylene	1.0		2 J		
Styrene	0.9		2 J		
<b>Total Chlorinated VOCs</b>		<b>480</b>	<b>41</b>	<b>29</b>	<b>31</b>
<b>Total Non-Chlorinated VOCs</b>		<b>290</b>	<b>51</b>	<b>10</b>	<b>85</b>

**TABLE 3-5 (Continued)**

**AIR MONITORING RESULTS (ug/m<sup>3</sup>)**

**AS/SVE NWIRP CALVERTON**

*	Total non-chlorinated VOCs values do not include acetone, 2-butanone and total chlorinated VOCs do not include methylene chloride because of possible laboratory contamination.
Blank	Chemical not detected above Method Detection Limit (MDL).
J	Estimated value.
D	Analysis of a diluted sample.
Note -	The planned air to be collected in December 1995 were not collected. The system was shut down approximately 1.5 weeks early because of unanticipated cold weather.

TABLE 3-6

AIR RESULTS - DRAEGER TUBE ANALYSIS  
AS/SVE - NWIRP CALVERTON

Entering Activated Carbon Unit

Date	Toluene (ppm)	Total Petroleum Hydrocarbons (ppm)	Carbon Dioxide (%)	Flame Ionization Detector (ppm)	Oxygen (%)
09/01/95	35	35	-	-	-
09/07/95	40	30	1.0	-	19
09/29/95*	4	25	2.8	-	14
10/25/95	2	20	1.0	-	15
11/20/95	7	20	0.5	-	-
05/01/96*	-	-	4.2	-	-
05/01/96	-	-	3.0	-	-
05/02/96	-	-	2.5	125	-
05/09/96	-	-	1.5	-	-
05/16/96	-	-	1.0	-	-
05/23/96	-	-	1.0	-	-
05/30/96	-	-	1.5	-	-
06/07/96*	0	5	1.5	52	-
06/13/96	-	-	0.5	-	-
06/20/96	-	-	0.6	-	-
06/27/96	-	-	0.6	-	-
07/02/96	-	-	0.6	-	-

TABLE 3-6 (Continued)  
AIR RESULTS (ppm) - DRAEGER TUBE ANALYSIS  
AS/SVE - NWIRP CALVERTON

E19-E23 Data (Urea Addition Test)

Date	CO2 - E19 to E23 (%)	CO2 - E 20 (%) (Urea added)	CO2 - E22 (%) (Control)
09/07/95	1.5	1.8	1.6
09/12/95*	2.1	1.9	1.9
10/25/95	3	2.1	2.4
11/20/95	0.5	0.8	0.8
05/01/96*	6.0	-	-
05/02/96	2.0	-	-
06/07/96*	2.5	7.0	2.0
06/20/96	0.6	2.0	0.5
06/27/96	0.6	2.2	0.5
07/02/96	0.6	2.0	0.5

- Indicates that data is not available.

\* Results should be used with caution since system was done prior to measurement.

Background air sample CO2 measurement (05/01/96): 0.1%/5 pumps = 0.2%.

Background CO2 measurements from Well E32 (downgradient of free product area) are as follows.

05/02/95: 0.2%  
06/13/96: 0.1%  
07/02/96: 0.2%

TABLE 3-8

**FREE PRODUCT DATA  
AS/SVE NWIRP CALVERTON**

Month/ Year	Average Free-Product Thickness (feet)										Free Product Removed (gallons)
	DG (01)	DH (02)	DF (03)	DM (07)	DN (08)	DV (09)	DP (10)	DR (12)	DS (13)	Aver.	
01/93	0.01	0.03	0	0.1	0.04	0	0	0.04	0.1	0.04	0.15
02/93	0	0	0	0.1	0	0	0	0.01	0.01	0.01	0.05
05/93	0.06	0.04	0	0.03	0	0	0	0.01	0.02	0.02	0.1
06/93	0.13	0.01	0	0	0.01	0	0	0.01	0	0.02	0.1
07/93	0.06	0	0	0	0	0	0	0.01	0	0.01	0
08/93	0.13	0.02	0	0	0	0	0	0.01	0	0.02	0.15
09/93	0.15	0.17	0	0	0	0.01	0	0.01	0	0.04	0.55
10/93	0.17	0.7	0	0	0.01	0.01	0	0	0.18	0.12	2.25
11/93	0.16	0.68	0	0	0.01	0.01	0	0.02	0.32	0.13	1.5
12/93	0.04	0.11	0	0.1	0.01	0.05	0	0.06	0.08	0.05	0.25
Average (1993)	0.09	0.18	0	0.03	0.01	0.01	0	0.02	0.07	0.04	5.1
02/94	0	0	0	0.13	0	0	0	0	0.06	0.02	0.1
03/94	0.02	0	0	0.07	0	0	0	0	0	0.01	0.5
04/94	0	0	0	0.02	0.01	0	0	0	0	0	0.05
05/94	0	0	0	0.01	0.01	0	0	0	0	0	0
06/94	0	0	0	0	0.01	0	0	0	0	0	0
07/94	0.01	0	0	0	0	0	0	0	0	0	0
08/94	0.05	0.02	0	0	0.01	0	0	0	0	0.01	0.10
09/94	0.01	0.06	0	0	0	0.02	0	0	0	0.01	0.8
10/94	0	0.05	0	0.01	0	0	0	0	0.01	0.01	2.3
11/94	0.04	0.2	0	0.01	0	0.02	0	0.01	0.25	0.06	2.0
12/94	0	0.08	0	0.01	0.01	0	0	0.38	0.25	0.08	3.5
Average (1994)	0.01	0.04	0	0.02	0	0	0	0.04	0.05	0.02	9.44

TABLE 3-8 (Continued)  
FREE PRODUCT DATA  
AS/SVE NWIRP CALVERTON

Month/ Year	Average Free-Product Thickness (feet)										Free Product Removed (gallons)
	DG (01)	DH (02)	DF (03)	DM (07)	DN (08)	DV (09)	DP (10)	DR (12)	DS (13)	Aver.	
01/95	0	0.01	0	0.14	0.02	0	0	0.015	0.03	0.02	0.65
02/95	0	0	0	0.04	0	0	0	0	0.01	0.01	0.2
03/95	0	0	0	0.10	0.01	0	0	0	0.03	0.02	0.1
04/95	0.01	0.01	0	0.04	0	0.01	0	0	0.02	0.01	0
05/95	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	-
06/95	0.02	0.06	0	0.02	0.01	0.05	0	0.98	0.69	0.20	2.5
07/95	0.06	0.25	0	0.07	0.01	0.02	0	0.48	0.73	0.18	9.25
08/95	0.03	0.09	0.02	0.01	0	0.05	0	0.22	1.01	0.16	5.25
Average (1995)	0.02	0.06	0.00	0.06	0.01	0.02	0.00	0.24	0.36	0.09	17.95
Start of Pilot Test (08/31/95)											
09/95	0.04	0.05	0.05	1.12	0.05	0.9	0.68	0.07	0.91	0.43	5.5
10/95	0.33	0	0.02	0.87	0.05	0.82	0.47	0.09	0.84	0.39	6.5
11/95	0	0.25	0.03	0.68	0.02	0.61	0.37	0.34	0.51	0.31	5.5
12/95	0.15	0.05	0	0.15	0	0.2	0	0.25	0.2	0.11	0.5
Average (1995)	0.13	0.09	0.03	0.71	0.03	0.63	0.38	0.19	0.62	0.31	18
05/96	0.09	0.27	-	0.01	0.01	0	0.01	0.15	0.13	0.08	0
06/96	0.07	0.29	-	0.03	0	0.01	0.01	0.10	0.12	0.08	0



**TABLE A**  
**RADIAL EXTENT OF INFLUENCE TESTS**  
**AS/SVE - NWIRP CALVERTON**

MEASURED AIR FLOW RATES AND VACUUM					INDUCED PRESSURE CHANGES AT MONITORING LOCATIONS (inches water column)			
Test No.	Surrounding Wells	Air Extraction Well E17 Air Flow (cfm)	Vacuum (inches water)	Air Injection Well I9 Air Flow (cfm)	Location ID (distance from Well E17, ft)			
					WP1 (11 ft)	WP2 (21 ft)	WP3 (30 ft)	WP4 (40 ft)
1	Off	5	-0.88	Off	-0.20	-0.12	-0.08	NT
2	On	5	-0.64	9	0.06	0.11	0.21	0.00
3	Off	5	-0.6	Off	-0.04	-0.02	-0.02	0.00
4	Off	8	-1	Off	-0.14	-0.08	-0.04	tick
5	Off	12	-1.6	Off	-0.13	-0.04	-0.04	tick

NT - Well not tested.

tick - Small needle deflection on the monitoring device which cannot be quantified.

Measured vacuums are indicated by negative sign preceding value ( - ).